

We claim:

1. An antenna, comprising:
  - a substrate having a first side and a second side;
  - a first conductor coupled to the first side of the substrate;
  - a second conductor coupled to the second side of the substrate;
  - 5 the first conductor comprising a feed element, at least one first side wide element, and a terminating element;
  - the second conductor comprising at least one second side narrow element and a plurality of second side wide elements;
  - the plurality of second side wide elements being substantially aligned
  - 10 beneath at least the feed element and the terminating element;
  - the at least one second side narrow elements being substantially aligned beneath the at least one first side wide elements;
  - the feed element containing a short to one of the plurality of second side wide elements;
  - 15 the terminating element containing a short to another of the plurality of second side wide elements; and
  - a power feed connected to the feed element.
2. The antenna according to claim 1, wherein
  - the at least one first side wide elements comprise a plurality of first side wide elements;
  - the at least one second side narrow element comprises a plurality of
  - 5 second side narrow elements; and
  - further comprising at least one first side narrow element; wherein
  - at least one of the plurality of second side wide elements is
  - substantially aligned beneath the at least one first side narrow element.
3. The antenna according to claim 1, wherein the power feed is
- substantially about a transition between the feed element and one of the first side wide elements.

4. The antenna according to claim 3, wherein the power feed is a coaxial cable having a power conductor and an outer jacket, the power conductor is coupled to the feed element and the outer jacket is coupled to the second conductor.

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5. The antenna according to claim 3, wherein the at least one first side narrow element resides between alternating ones of the first side wide elements.

6. The antenna according to claim 3, wherein the at least one first side narrow element comprises a plurality of first side narrow elements.

7. The antenna according to claim 6, wherein the plurality of first side wide elements comprises M first side wide elements, the plurality of first side narrow elements comprises N first side narrow elements, wherein M is greater than N.

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8. The antenna according to claim 7, wherein M equals N+1.

9. The antenna according to claim 2, wherein the at least one first side narrow element has a length L.

10. The antenna according to claim 1, wherein the at least one first side wide elements have a length L'.

11. The antenna according to claim 9, wherein the plurality of first side wide elements have a length L'.

12. The antenna according to claim 11, wherein L equals L'

13. The antenna according to claim 12, wherein the feed element and the terminating element have a length  $L''$ .
14. The antenna according to claim 13, wherein  $L''$  equals  $L/2$ .
15. The antenna according to claim 14, wherein  $L$  equals a  $\frac{1}{2}$  wavelength.
16. The antenna according to claim 15, wherein  $L$  is adjusted for dielectric properties of the substrate.
17. The antenna according to claim 9, wherein the at least one first side narrow element has a width  $W$ .
18. The antenna according to claim 1, wherein the at least one first side wide element has a width  $W'$ .
19. The antenna according to claim 17, wherein the plurality of first side wide elements have a Width  $W'$ .
20. The antenna according to claim 17, wherein the at least one first side narrow element is a plurality of first side narrow elements, and the first side narrow elements have a plurality of widths  $W$ .
21. The antenna according to claim 17, wherein the plurality of first side wide elements comprise a plurality of widths  $W'$ .
22. The antenna according to claim 17, wherein the feed element and the terminating element have a width  $W''$ .
23. The antenna according to claim 22, wherein  $W$  equals  $W''$ .

24. The antenna according to claim 22, wherein width  $W''$  comprises a plurality of widths  $W''$ .

25. The antenna according to claim 1, wherein the first conductor and the second conductor comprises cut sections of pre-formed conducting tape, wherein the conducting tape comprises a plurality of narrow elements alternating with a plurality of wide elements.

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26. The antenna according to claim 1, wherein the substrate has a thickness  $d$ .

27. An antenna comprising:

a substrate having a first side and a second side;

a first conductor on the first side having a first end and a second end;

the first end of the first conductor being a feed element;

5 the second end of the conductor being a terminating element;

between the feed element and the terminating element resides

alternatingly a plurality of first means for radiating and a plurality first means

for transmission;

the second conductor comprising alternatingly a plurality of second

10 means for transmission and a plurality of second means for radiating, such

that the plurality of first means for radiating reside substantially above the

plurality of second means for transmission and the plurality of first means for

transmission reside substantially above the plurality of second means for

radiating; and

15 a power feed coupled to the feed element.

28. The antenna according to claim 27, wherein the plurality of first means for transmission and the plurality of second means for transmission comprise conductors having at least one width; and the plurality of first means for radiating and the plurality of second means for radiating comprise

5 conductors having at least one relatively wider width.

29. The antenna according to claim 28, wherein the plurality of first means for transmission, the plurality of first means for radiating, the plurality of second means for transmission, and the plurality of second means for radiating have a length  $L$ ; and the feed element and the terminating element

5 have a length  $L/2$ .

30. The antenna according to claim 27, wherein the feed element is shorted to one of the plurality of second side radiating elements; and the terminating element is shorted to another one of the plurality of second side radiating elements.

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31. The antenna according to claim 27, wherein at least one second means for transmission resides beneath each of the feed element and the terminating element.

32. An antenna comprising:  
a first conductor;  
a second conductor;  
means for providing separation between the first conductor and the  
5 second conductor;  
a first conductor comprising a first end and a second end;  
the first end of the first conductor being a feed element;  
the second end of the first conductor being a terminating element;  
between the feed element and the terminating element resides at least  
10 one first means for radiating;  
the second conductor comprising alternately at least one first means  
for transmission and a plurality of second means for radiating, such that the at  
least one first means for radiating resides substantially above the at least one  
first means for transmission; and  
15 a power feed coupled to the feed element.

33. The antenna according to claim 32, wherein the means for  
providing separation comprises at least one substrate.

34. The antenna according to claim 32, wherein the means for  
providing separation comprises at least one short.

35. The antenna according to claim 32, wherein the means for  
providing separation comprises at least one dielectric post.

36. The antenna according to claim 32, wherein  
the at least one first means for radiating comprises a plurality of first  
means for radiating;  
the at least one first means for transmission comprises a plurality of  
5 first means for transmission aligned substantially below the plurality of first  
means for radiating;

and further comprising at least one second means for transmission,  
wherein the plurality of first means for radiating and the at least one second  
means for transmission are arranged alternatingly on the first conductor and  
10 the at least one second means for transmission is aligned substantially above  
at least one of the second means for radiating.

37. The antenna according to claim 32, wherein the at least one first  
means for transmitting has at least a first relatively narrow width, and the at  
least one first means for radiating and the plurality of second means for  
radiating comprise conductors having at least one relatively wider width.

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38. An antenna, comprising:  
a first conductor;  
a second conductor;  
means for providing separation between the first conductor and the  
5 second conductor;  
the first conductor comprising a feed element, at least one first side  
wide element, and a terminating element;  
the second conductor comprising at least one second side narrow  
element and a plurality of second side wide elements;  
10 the plurality of second side wide elements being substantially aligned  
beneath at least the feed element and the terminating element;  
the at least one second side narrow elements being substantially  
aligned beneath the at least one first side wide elements;  
the feed element containing a short to one of the plurality of second  
15 side wide elements;  
the terminating element containing a short to another of the plurality of  
second side wide elements; and  
a power feed connected to the feed element.

39. The antenna according to claim 38, wherein the means to  
provide separation comprises a substrate.

40. The antenna according to claim 38, wherein the means to  
provide separation comprises the shorts.

41. The antenna according to claim 38, wherein the means to  
provide separation comprises at least one dielectric post.

42. A method of making an antenna array, the method comprising the steps of:

providing a substrate having a first side and a second side;

coupling a first conductor to the first side, the first conductor  
5 comprising at least one feed element, at least one terminating element, at least one narrow element, and a plurality of wide elements; and

coupling a second conductor to the second side, the second conductor comprising a plurality of narrow elements and a plurality of wide elements, wherein the coupling a second conductor step comprises arranging the second  
10 conductor such that the first conductor wide elements are above the second conductor narrow elements and the first conductor narrow elements are above the second conductor wide elements.

43. The method of claim 42, wherein the providing a substrate step comprises:

a first injection molding step to mold a non-platable portion of the substrate from a non-platable material;

5 a second injection molding step to mold a platable portion of the substrate from a platable material; and

wherein the coupling the first conductor step and the coupling of the second conductor step includes plating the substrate.

44. The method according to claim 42, wherein the coupling the first conductor step and the coupling of the second conductor step includes coating the first surface with a conductor and coating the second  
surface with a conductor;

5 arranging a etch resistant material on the conductor;

applying an etching agent to etch the conductor material; and

removing the etch resistant material such that the first conductor and the second conductor are formed.

45. The method according to claim 42, wherein the coupling the first conductor step and the coupling of the second conductor step includes providing a metal foil as the conductor and stamping the metal foil on the substrate.

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46. The method according to claim 42, wherein the coupling the first conductor step and the coupling the second conductor step includes embossing.

47. A method of making an antenna array, the method comprising the steps of:

- providing a substrate having a first side and a second side;
- cutting first conductor from a first length of pre-formed conductor,
- 5 wherein the first length is determinable from a desired gain of the antenna;
- cutting a second conductor from a second length of pre-formed conductor wherein the second length is determinable from the desired gain of the antenna; and
- coupling the first conductor to the first side and the second conductor
- 10 to the second side.

48. The method according to claim 47, wherein the pre-formed conductor comprises conductive tape.

49. The method according to claim 47, wherein the pre-formed conductive tape is arranged in alternating wide and narrow sections.

50. A method of making an antenna array, the method comprising the steps of:

providing a first conductor having a feed element, at least one relatively wide section, and a terminating element;

5 providing a second conductor having a plurality of relatively wide sections and at least one relatively narrow section;

arranging the first conductor above the second conductor such that the feed element and terminating element are substantially aligned with relatively wide sections of the second conductor and the relatively wide section of the first conductor is substantially aligned with the relatively narrow section of the  
10 second conductor; and

providing a means to separate the first conductor and the second conductor in as arranged in the arranging step;

51. The method according to claim 50, wherein the means to separate provided is a substrate, and the arranging step includes arranging the first conductor and the second conductor on the substrate.

52. The method according to claim 50, further comprising placing a plurality of shorts such that the plurality of shorts provide the means to separate.

53. The method according to claim 50, wherein the means to separate comprises at least one dielectric post.